



Executive Summary

Watershed Overview

The Mill Creek watershed is located in the southern portion of James City County (JCC) between the Powhatan Creek and College Creek watersheds (Figure ES-1). At approximately 5.7 square miles in size, the Mill Creek watershed is among the smallest watersheds in JCC, and is located almost entirely within the County limits. The watershed is also the most developed of all watersheds, with impervious cover totaling roughly 15 percent or 554 acres. However, impervious cover is not evenly distributed throughout the watershed but rather is concentrated in the northern two-thirds and in non-tidal areas, with the dividing line roughly coincident with Lake Powell Road (SR 618).

The majority of the impervious cover in the Mill Creek watershed is associated with neighborhoods populated by single family homes, and 71 subdivisions are present. Commercial development is also present in the form of shopping centers and scattered office buildings. The vast majority of the watershed (45%) is zoned as Limited Residential (R1), with the majority of buildings being single family residences in low-medium density subdivisions that range from 50 years old to recent development. The Mill Creek watershed is essentially built-out, with little opportunity for redevelopment. A substantial 27 percent (973 acres) of the Mill Creek watershed lies within a Resource Protection Area (RPA), with 26 percent of the watershed being forested.

Watershed Assessment

Development within the Mill Creek watershed is highly focused in the upper watershed, with comparatively little infrastructure present south of Lake Powell or distant from Jamestown Road. In fact, over 80 percent of the residences and all of the commercial retail space lie in the upper 60 percent of the watershed, which means development is highly focused in headwater areas. The lower portion of the watershed, just above the confluence with the James River, is characterized by estuarine wetlands and, at higher elevation, agricultural land uses. For this reason, the Baseline Watershed Assessment was restricted to the uppermost four watersheds, designated as 201, 202, 203, and 204 (Figure ES-2). Impervious cover within these subwatersheds ranges from 18.8% to 26.4%. The Impervious Cover Model (Schueler, 1994) classifies any watershed with between 10 percent and 25 percent cover as



IMPACTED, which means runoff from urbanized areas is triggering stream channel and stream bank erosion. Three of the four subwatersheds in the upper Mill Creek watershed fall into this category. Any watershed with greater than 25 percent impervious cover is considered to be NON-SUPPORTING, which is typically characterized by severe stream channel and bank erosion, further degradation in stream habitat, high nutrient and sediment loads, and bacteria levels that may prohibit recreational activities. Subwatershed 201 falls into this category.

Stream, Floodplain, and Conservation Area Assessment

A comprehensive evaluation of virtually all streams was carried out within each of the four target subwatersheds. Field efforts were carried out to characterize the condition of in-stream and riparian habitat; document occurrences of stream instabilities such as bank and channel erosion; map the location of stormwater outfalls, utility and other stream crossings, and trash and debris; and to help identify and prioritize potential stormwater retrofit, stream restoration, and/or riparian buffer management opportunities.

The results of the Stream and Floodplain Assessment are summarized below:

- An evaluation of stream habitat found that the vast majority of streams fall into the fair category (47%), with 26% classified as good, 14% as excellent, and 14% as poor.
- Floodplain conditions scored higher than did stream habitat, with 44% of streams ranked as good to excellent, 47% as fair, and just 9% as poor.
- The stream and floodplain assessment determined that the overall Mill Creek watershed is in fair condition, with notable reaches that are considerably impaired by uncontrolled stormwater input and associated bank and channel erosion and excess sedimentation. Most problem areas are located in the upper reaches of first order tributaries.
- Stormwater outfalls represent the most abundant point impact, with 86 outfalls mapped and characterized. The principal issues observed at outfalls include limited velocity dissipation and undermined and failing components.

Because of the degree of development within the Mill Creek watershed, very few areas remain as candidates for conservation. Areas of potential habitat for rare, threatened and endangered (RTE) plants and animals were nevertheless evaluated. No conservation areas of any appreciable size were identified within any of the subwatersheds in the Mill Creek watershed.



Existing Stormwater Infrastructure and Pollutant Loading.

A total of 58 stormwater BMPs are present within the Mill Creek watershed. These include wet and dry ponds, dry swales, infiltration trenches, and stormwater wetlands (i.e., shallow marsh). Drainage areas were delineated to 54 of these systems, giving a treatment area of approximately 1,018 acres, or 28 percent of the watershed. In general, treatment for residential areas is provided by wet ponds while treatment for commercial areas is provided by on-site systems such as swales, bioretention, infiltration trenches, and small dry ponds. Wet ponds appear to be functioning as designed and many are covered with algae growth, indicating that nutrients are being removed in the pond rather than flowing through to receiving waters.

A significant portion of the impervious area in the watershed appears to be disconnected. Older subdivision streets have open-section grassed channels for storm drainage, providing some disconnection, at least for smaller rain events. Many of the primary streets are drained in the same manner. Because of the high level of disconnected downspouts, the main source of runoff appears to be the street network. Neighborhood Source Assessments did not reveal significant sources of pollution, other than some areas of highly managed lawns. About half the lawns assessed could be described as high maintenance. These were generally in the newest subdivisions, and were generally associated with commercial lawn care services. A Hotspot Investigation of the three shopping centers and one gas station in the watershed identified no active sources of pollution, though waste and dumpster management represent potential sources.

Pollutant loading modeling determined that urban runoff is the primary source of potential pollutants within each of the four subwatersheds. However, because the entire Mill Creek watershed lies within the Primary Service Area, most residences are connected to the municipal sanitary sewer system. Sanitary sewer overflows (SSO's) are another potential source of pollution.

The Mill Creek watershed was first listed as impaired for fecal coliform on Virginia's 2002 303(d) Report on Impaired Waters. With the adoption of a new water quality standard for enterococci bacteria for saltwater and transition zones in 2003, Mill Creek was first listed as non supporting for recreational use on the 2006 305(b)/303(d) Water Quality Assessment Integrated Report. Mill Creek continues to be listed as thus impaired on the 2010 edition of this same report. Runoff from residential areas and SSO's are thought to present the most prolific – and most controllable – sources of bacteria in Mill Creek and its tributaries.



Realizing Watershed Goals through Strategic Actions

JCC has developed two overarching goals for watershed protection and restoration:

1. Minimize the further degradation of **water quality** in Mill Creek and preserve, restore and maintain the quality of all streams within the watershed as well as tidal and nontidal wetlands.
2. Promote active **stewardship** among residents, community associations, businesses, and seasonal visitors.

Realizing these goals and addressing watershed issues involves the implementation of two types of Strategic Action. These represent the core of the watershed management plan.

1. **Watershed Restoration Projects** such as restoring degraded stream channels, retrofitting BMPs, and addressing sanitary sewer maintenance in a timely manner; and
2. **Administrative / Technical and Educational Efforts** aimed at increasing JCC staff and stakeholder awareness, fostering watershed stewardship, augmenting baseline information about watershed resources, and realizing opportunities for land conservation and redevelopment through the pursuit of shared goals and transparent communication with and between property owners.

The 12 Strategic Actions developed for the Mill Creek watershed are provided in the attached Table ES-1. These Strategic Actions were developed and then prioritized based in large part on stakeholder feedback collected from two meetings. The first was conducted on May 20, 2010, during which the results of the Baseline Assessment were presented. The second meeting was held on March 30, 2011. Draft Strategic Actions were presented and attendees were given the opportunity to rank them based on their relative importance.

Watershed Restoration Opportunities

The stream and floodplain assessment determined that bottomland areas represent active and important floodwater and sediment storage areas. In general, stream condition is fair to good in these areas. By contrast, headwater streams were observed to be relatively unstable, with bank and channel erosion being noted immediately downstream of stormwater outfalls. Curtailing sediment delivery from



these upstream sources and protecting infrastructure should be considered a key goal, and can be accomplished through stream restoration or enhancement and/or retrofitting stormwater outfalls. Nineteen such opportunities have been identified. Other issues requiring attention are localized concerns at stormwater outfalls (5), sewer line stream crossings and instances of exposed lateral pipes in banks (2), localized bank erosion (2) and occurrences of trash and debris (5), and impacted riparian buffers (2).

Potential stormwater retrofit opportunities to improve water quality and protect channels were identified by carrying out a Retrofit Reconnaissance Inventory. Opportunities include wet pond and dry pond retrofits, parking lot retrofits, and culvert retrofits. There is also potential for retrofitting the open section drainage system to dry swales or water quality swales in areas where additional water quality treatment is recommended. A total of 18 projects were identified. Besides these projects, storm drain stenciling is generally lacking and could be improved.

The 19 stream and 18 stormwater retrofit sites were subject to a preliminary ranking using a Decision Support System (DSS). The DSS supports organizational decision making activities based on a consideration of watershed goals and the degree to which a project can satisfy these goals based on eight Prioritization Factors and eight Possible Conflicts. These are provided in the table below.

Table ES-2: DSS Prioritization Factors and Possible Conflicts

Prioritization Factors	Possible Conflicts
Water Quality / Runoff Quantity	Utility Conflicts
Restore Floodplain Connectivity	Construction Access
Aquatic Habitat	Neighborhood Impact
Sedimentation	Physical Feasibility
Environmental Awareness	Level of Design
Project Size / Scope	Private Property
Channel Condition	Permitting Issues
Condition of Contributing Watershed	Negative Environmental Impacts

Components of the Mill Creek Watershed Management Plan

The *Mill Creek Watershed Management Plan* consists of the following Chapters:

Chapter 1: provides a Watershed Overview and discusses why watershed management planning is important.

Chapter 2: summarizes the Baseline Assessment.



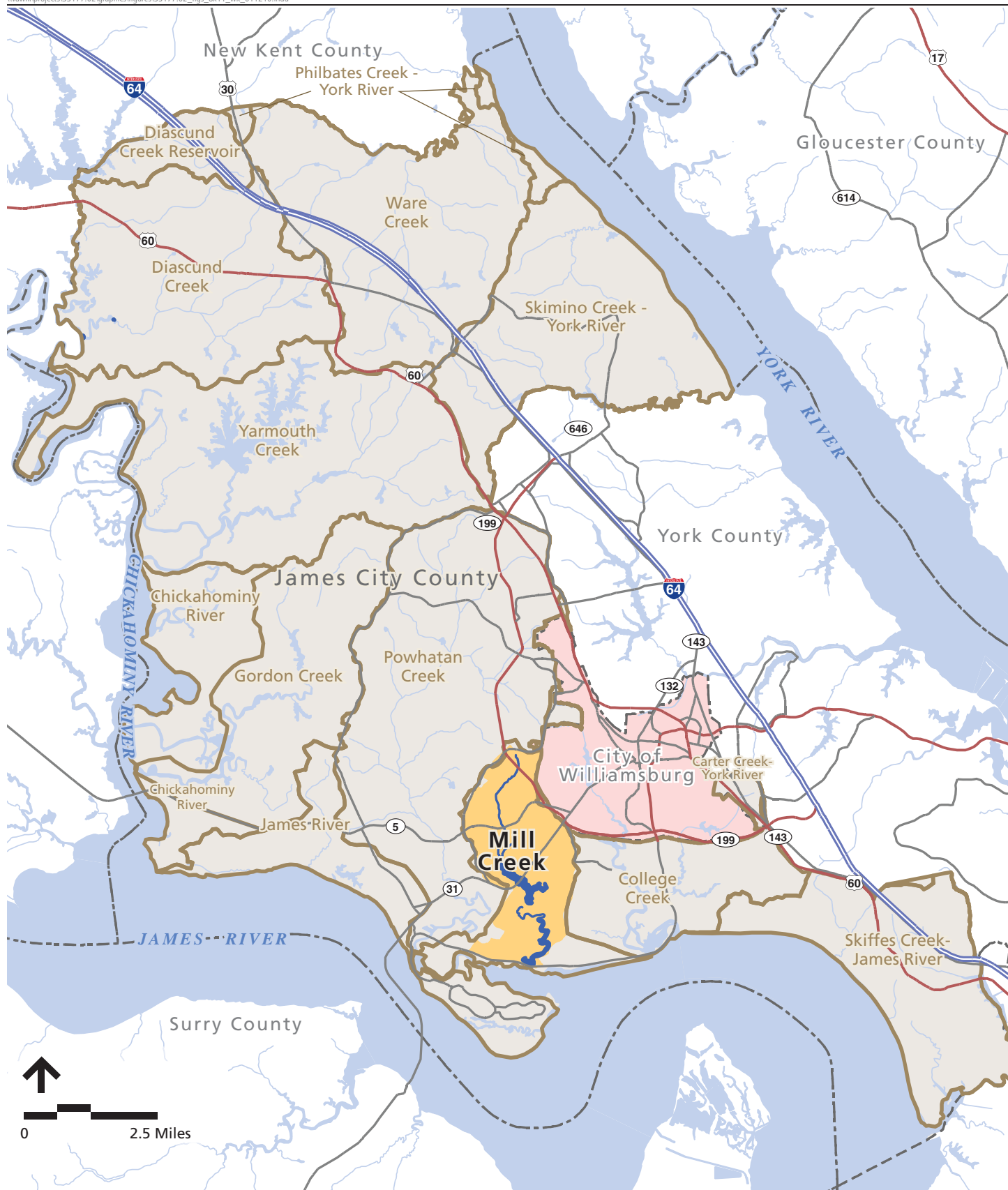
Chapter 3 describes the development of Watershed Goals and Strategic Actions for their realization.

Chapter 4 discusses the methods used to select candidate Watershed Restoration Projects and presents their location within the watershed.

Chapter 5 presents the Strategic Action Plan, outlining the tentative timeframe for the execution of the Strategic Actions, their approximate cost, and responsible parties.

Chapter 6 includes individual Subwatershed Management Plans that summarize conditions within the four uppermost subwatersheds. These are designed to act as quick reference guides for JCC staff and include a general description of the subwatershed, the proposed watershed restoration opportunities therein and their estimated cost, and a variety of other tabular information such as:

- land use;
- impervious area;
- stormwater management practices and drainage areas treated;
- existing condition pollutant loading ;
- existing urban runoff loads; and
- estimated pollutant loading reductions based on proposed retrofits.



LEGEND

- National Watershed Boundary Dataset
- Mill Creek Watershed
- County Boundaries



**James City County
Watershed Planning Services**
Mill Creek Watershed Management Plan

Figure ES-1

James City County Watersheds

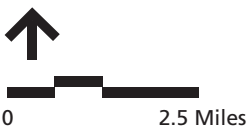
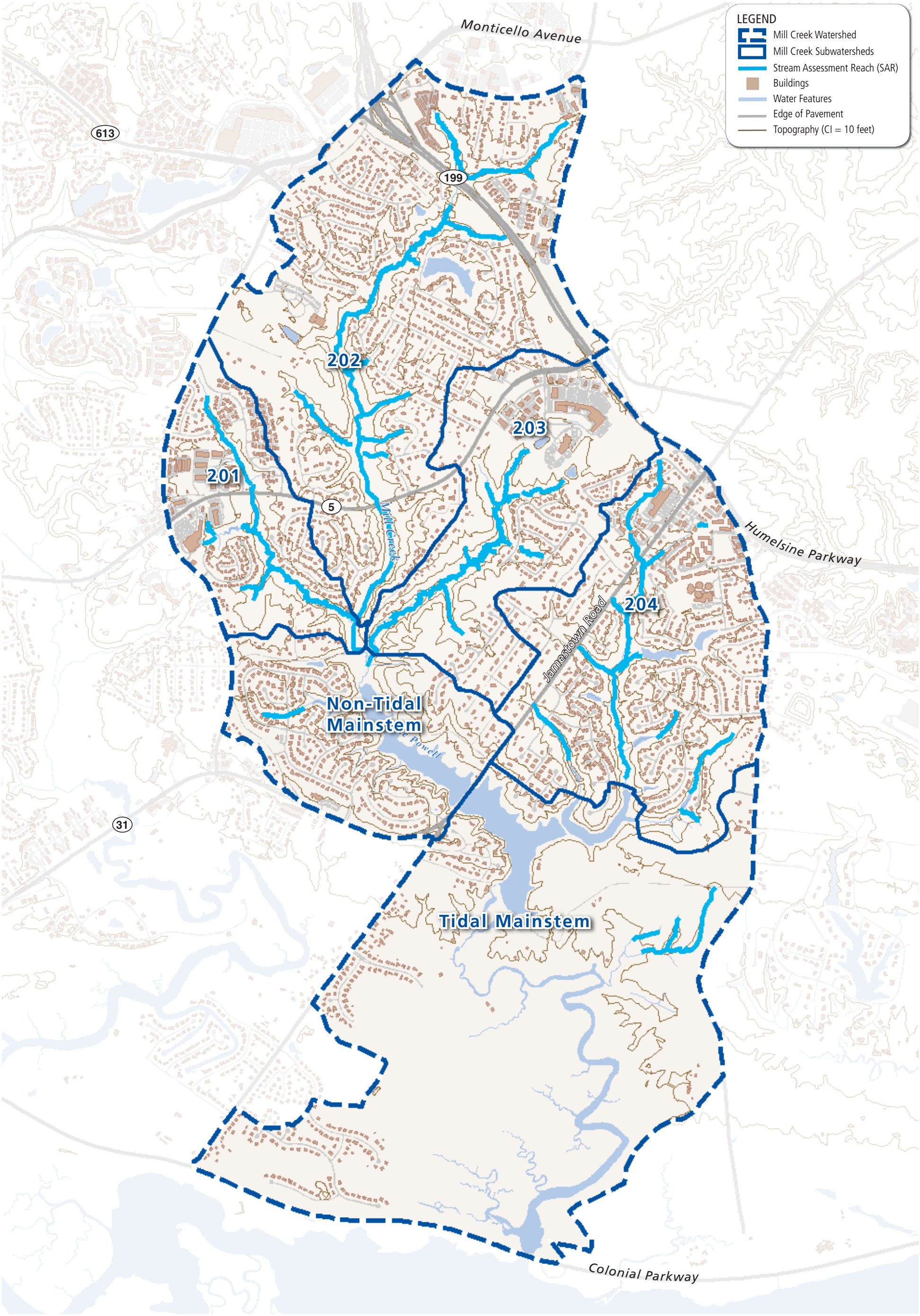




TABLE ES-1: DRAFT MILL CREEK WATERSHED PROTECTION AND RESTORATION GOALS AND STRATEGIC ACTIONS FOR GOAL REALIZATION

a. Watershed-Wide Protection and Restoration Goals

Goal	Description
1	Minimize the further degradation of water quality in Mill Creek and preserve, restore and maintain the quality of all streams within the watershed as well as tidal and nontidal wetlands.
2	Promote active stewardship among residents, community associations, businesses, and seasonal visitors.

b. Strategic Actions for Watershed Protection and Restoration and Estimated Costs

Priority	Goals	Strategic Action	Watershed Location	Cost to County and Action	Coordinating Parties
1	1	Provide incentives for new development and redevelopment to add intermittent stream buffers, expanded RPA and mainstem buffers, minimize impervious cover, and maximize remaining contiguous open space.	watershed wide & County wide	HIGH: >\$200K	ED, PD, DM
2	1, 2	Identify areas within the watershed where riparian corridors are in an unnatural condition and seek ways, including incentives, to restore those areas to their natural condition	watershed wide & County wide	MODERATE: \$15-25K	DM, ED, SD, GS, GIS, outside agencies
3	1	Continue to fully implement the requirements of the County's MS4 permit in relation to watershed management throughout County.	watershed wide & County wide	SMALL: already underway	ED, SD, GS, JCSA, GIS
4	1	Fully implement the Mill-Powhatan Creek Bacterial TMDL Implementation Plan in response to ongoing water quality concerns	watershed wide	HIGH: >\$2M	DM, ED, PD, SD
5	1	Update or develop new Better Site Design (BSD) educational materials to be made available to developers and homeowner's associations and conduct training.	watershed wide & County wide	SMALL: largely internal coordination	DM, ED, PD, SD
6	1	Continue to work with County departments to incorporate BSD requirements into applicable ordinances and into the County BMP Manual, and to develop consistent review procedures.	watershed wide & County wide	SMALL: largely internal coordination	DM, ED, PD, SD
7	1,2	Use subwatershed maps to ensure James City County staff and stakeholder awareness of existing locations for restoration and potential retrofits.	watershed wide	SMALL: internal coordination	ED, DM, GIS, PD, SD

Key: DM = Development Management, ED = Environmental Division, GIS = GIS/Mapping Section, GS = General Services, JCSA = James City Service Authority
PD = Planning Department, SD = Stormwater Division, SH = stakeholders



TABLE ES-1: DRAFT MILL CREEK WATERSHED PROTECTION AND RESTORATION GOALS AND STRATEGIC ACTIONS FOR GOAL REALIZATION

a. Watershed-Wide Protection and Restoration Goals

Goal	Description
1	Minimize the further degradation of water quality in Mill Creek and preserve, restore and maintain the quality of all streams within the watershed as well as tidal and nontidal wetlands.
2	Promote active stewardship among residents, community associations, businesses, and seasonal visitors.

b. Strategic Actions for Watershed Protection and Restoration and Estimated Costs

Priority	Goals	Strategic Action	Watershed Location	Cost to County and Action	Coordinating Parties
8	2	Continue to support and grow a citizen/volunteer-based team of individuals to routinely perform rudimentary assessments of stream health, including sampling for benthic macroinvertebrates, water quality measurements for coarse indicators, and photodocumentation.	watershed wide	SMALL: already underway	ED, SD, SH, outside consultants/agencies
9	2	Improve the availability of educational materials by developing materials for use by HOA's and neighborhood associations. Also use the PRIDE website. Educate people about watershed awareness including proper disposal of fats, oils, grease, and other chemicals, wildlife management, pet waste, onsite waste disposal systems, rubbish, and boat wakes.	watershed wide	SMALL: use stakeholder meetings for insight	DM, ED, PD, SD, SH
10	1	Conduct additional feasibility assessments, validate, and carry out the stormwater retrofits and stream restoration opportunities identified in this watershed plan	all but non-tidal and tidal mainstem	HIGH: >\$2M	DM, ED, SD
11	2	Consider participation in the Virginia Big Tree or similar recognition program to identify historic and specimen trees and promote the importance of trees to the landscape	watershed wide & County wide	SMALL: explore academic or volunteer consulting input	DM, ED, SD, GS, GIS, outside agencies
12	1	Develop an inter-departmental rapid response protocol and team to deal with unforeseen and emergency threats to water quality and infrastructure (e.g., leaking sewer lines, storm-related or unpredictable channel and bank erosion, hazmat spills, etc.)	watershed wide & County wide	SMALL: largely internal coordination	DM, ED, GIS, JCSA, SD, outside firm

Key: DM = Development Management, ED = Environmental Division, GIS = GIS/Mapping Section, GS = General Services, JCSA = James City Service Authority
PD = Planning Department, SD = Stormwater Division, SH = stakeholders